ARCHIVED REPORT

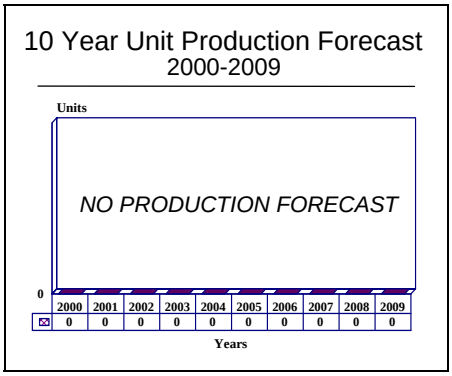
For data and forecasts on current programs please visit

www.forecastinternational.com or call +1 203.426.0800

APQ-170(V)/425(V) - Archived 10/2001

Outlook

- Upgrade producing new version for USAF
- Active logistics support continues



Orientation

Description. Airborne, dual-band, multimode radar.

Sponsor

US Air Force
Electronic Systems Center
Hanscom AFB, Massachusetts (MA) 01731
USA
Tel: +1 617 478 5980

Contractors

Lockheed Martin Corp
Tactical Systems
1801 State Route 17C
Owego, New York (NY) 13827
USA
Tel: +1 607 751 5601
Fax: +1 607 751 3259
Web site: http://www.lmco.com
(Avionics integrator prime)

Systems & Electronics Inc (SEI)
201 Evans Lane
St. Louis, Missouri (MO) 63121-1126
USA
Tel: +1 314 553 4529
Fax: +1 314 553 4555
Web site: http://www.seistl.com
(Avionics integrator prime)

Status. Ongoing logistics support and upgrades.

Total Produced. An estimated 27 units were produced.

Application. MC-130H, Combat Talon II.

Price Range. Estimated unit cost is US$3.2 million.

Technical Data

	Metric	US
Characteristics		
Frequency:	8 to 12 GHz 12 to 18 GHz	
Range		
8 to 12 GHz @ 250 ft AGL:	37 km	20 nm
12 to 18 GHz detection		
Coastlines:	93 km	50 nm
Towers:	9.3 km	5 nm
Radar beacons:	444 km	240 nm
Severe weather cell:	278 km	150 nm
MTBF:	92 hr (required)	
Terrain Following:	Up to 4°/sec turns	
Modes:	Terrain Following "Look Into Turn" Terrain Avoidance Precision Ground Mapping Weather Detection/Avoidance Beacon Interrogation	
LRUs:	Six	

Design Features. The APQ-170(V) was a major improvement to the MC-130H Combat Talon II aircraft. The radar's architecture was based on the IBM avionics design for the HH-60 Night Hawk helicopter program and features dual-band operation and complete redundancy. The aircraft systems feature significant integration of the aircraft's sensor systems and the flight/tactical data into comprehensive display capabilities for the flight crew. Four monochrome, multifunction ASQ-204(V) Horizontal Situation Displays dominate the pilot and copilot positions and can be set to display navigation data, radar imagery, and flight plans, as well as aircraft fuel and management information.

An identifying feature of the MC-130H is a reshaped nose radome (extended rounded wedge) to accommodate the new radar. It is longer than the MC-130E radome. A flat, circular antenna is used for the lower frequency portion of the radar. A truncated paraboloid is mounted on the back of the mount. Data from an AAQ-45(V) IR detection system and AAQ-15(V) FLIR can be combined with or used as a stealthy replacement for the radar information. The AAQ-15(V) can be slewed to flight path vectors and helps the pilots visually clear terrain and avoid threats, providing a high-quality image of terrain features that combines with the radar map and other systems to give the crew an accurate picture of the flight path and approaching terrain features.

The advanced avionics suite for the Special Operations aircraft combines the multimode radar capabilities of the APQ-170(V) with an inertial navigation system; low-level aerial delivery and container release system; AAR-44(V) missile warning equipment; ALQ-84(V) ECM pods; the ALQ-172(V) EW system; and ALR-69(V) RWR; along with IR jamming and chaff/flare dispensers. The advanced cockpit is night-vision-goggle compatible.

Operational Characteristics. MC-130H aircraft carry special navigation and aerial delivery systems that are used to locate small drop zones and deliver forces or equipment with greater accuracy and at higher speeds than possible with a standard C-130. The aircraft was designed to penetrate hostile airspace at low altitudes, at night, and in adverse weather. The mission computer helps the aircraft to stay low and fast at night. It also helps the crew to accurately drop supplies with reliable precision. Load and ballistics parameters are put into the mission computer prior to take-off and updated by the navigation systems once in the air. Pilots use the radar and FLIR to designate the drop zone, and when the coordinates in the computer line up, the load is automatically catapulted out of the aircraft by the new high-speed low-level aerial delivery and container release system.

The MC-130H features highly automated controls and displays to reduce crew work load, and the cockpit and cargo areas are compatible with night-vision goggles. The integrated control and display subsystem combines

basic aircraft flight, tactical, and mission sensor data into a comprehensive set of display formats tailored for each user.

The navigator uses radar ground map displays, forward-looking infrared display, tabular mission management displays, and equipment status information. The APQ-170(V) operates in two frequency bands to provide terrain following and terrain avoidance as well as navigation information in adverse weather conditions. The radar and FLIR sensors combine with advanced navigation equipment to provide superior situational awareness for the aircrew. The electronic warfare operator's displays present electronic warfare data and supplement the navigator's display in certain critical phases of a mission.

The radar has a Precision Ground Mapping mode and can perform beacon interrogation/reception with a ground map overlay for select missions. The terrain following mode operates during turns of up to 4º per second. Interleaved operations make it possible to simultaneously display terrain following, terrain avoidance, and precision ground mapping information with no radar performance degradation. The "Look Into Turn" feature allows for terrain following operation even during a turn maneuver.

Variants/Upgrades

APQ-425(V). An upgrade modification, contracted for in December 1997, calls for upgrading the US systems to the APQ-425(V) configuration.

Program Review

Background. The US Air Force decided to replace the MC-130E Combat Talon I Special Operations aircraft with the MC-130H Combat Talon II, a highly modified C-130 that grew out of '60s and '70s operations in Southeast Asia. The key feature of the new aircraft was an advanced avionics suite featuring state-of-the-art radar, forward-looking infrared (FLIR), and electronic warfare systems. Navigation was improved by combining special navigation equipment, including INS and night-vision sensors, with the APQ-170(V) mapping information.

The first aircraft modifications were authorized in FY88 with the (then) IBM Federal Sector Division integrating the new avionics suite. IBM subcontracted radar production to Emerson Electric Co (which became Electronics & Space Corp).

In the beginning, the radar was to be an off-the-shelf system, but requirements made extensive redesign work necessary, putting the program behind schedule by two years. At one point, the Air Force withheld progress payments until IBM could certify that the radar's terrain-following performance was as specified. Indications were that IBM once considered dropping its subcontractor.

The design effort was completed and the APQ-170(V) performed as specified. Test flights for the first fully modified aircraft began in 1988, and the first aircraft went into operation in June 1990.

In early 1993, reports surfaced that the radar was experiencing software and hardware problems which kept the MTBF at about half the required 92 hours. There apparently were antenna drive motor problems and false terrain and altitude readings. There have been false fly-up problems in the terrain-following mode. These problems were eventually solved.

In 1997, the Air Force contracted (US$16,698,561) for support efforts that included an upgrade to what would be known as the APQ-425(V) configuration of the radar.

Funding

Funding is through the airframe prime contractor. There are no specific AF budget lines for the radar.

Recent Contracts

(Contracts over US$5 million)

Contractor	Award ($ millions)	Date/Description
Lockheed Martin	28.7	Apr 1997 – Face-value increase to FFP contract to provide for the establishment of a depot-level repair capability at Robins AFB, GA, for the APQ-170(V) radar on the C-130H. Work performed by Systems & Electronics Inc, and completed by June 1999. (F33657-83/C-0264)
Systems & Electronics Inc (SEI)	16.7	Dec 1997 – A time and material, fixed-price, cost-reimbursable, no fee contract for Interim Contractor Support for the APQ-170(V) on the MC-130H Combat Talon II aircraft at four bases (two CONUS and two non-CONUS) as well as at the contractor's facility in St. Louis. This contract is exclusively for the USAF and covers repair of the radar and an upgrade modification to an APQ-425 configuration. (F33657-97-C-0004)

Timetable

Month	Year	Major Development
Dec	1987	First flight, unmodified
early	1988	Flight tests of modified aircraft begin
Jan	1990	First MC-130 delivered to operational unit
	1993	IOC
Mar	1995	Delivery of last aircraft
Dec	1997	APQ-425(V) upgrade contracted
	2012	Expected end of service life of MC-130H

Worldwide Distribution

This is a **US** only program.

Forecast Rationale

Precise navigation is crucial to both air and ground forces, as is the ability to make pinpoint drops and pickups. The MC-130H Combat Talon relies on its precise avionics suite and terrain-hugging to get forces where they need to be when they need to be there. The dual-frequency radar has the needed operational flexibility, and the complete redundancy is a critical confidence-builder.

Although the US will want to limit the availability of Combat Talon technology to select allies, there may well be some international interest in the system or some avionics components. Although the APQ-425(V) upgrade is specifically limited to the USAF, other US services may also consider retrofitting a version of the APQ-170(V) into some of their C-130s to improve their ability to support operations on the tactical battlefield. The system could also be adapted to other transports.

The increased likelihood of getting involved in contingency combat has increased the interest in, and need for, Special Operations forces that can react quickly to worldwide developments.

In the future, a new family of C-130 replacement radars, which add wind shear detection to mapping and other Special Operations modes, will dominate the market and preclude any new procurement of these systems. The March 2000 System Requirement Document (SRD) carried a statement that the replacement radar would replace the APQ-170(V), as well as APN-59(V), APN-122(V), and APQ-175(V). The new radar would be used as the primary navigation aid, providing

position updates, ground mapping and data for overlay with flight plan displays. It will also provide weather avoidance, beacon communication, skin paint, and guidance for aerial rendezvous and supplemental stationkeeping. The new radar system would meet or exceed the capabilities of radar systems installed on the C-130H. This is all-inclusiveness is something of a change from earlier replacement radar requirements. What impact this will have on Special Operations aircraft with their unique avionics needs is yet to be determined. Current plans are to select a contractor for the replacement radar in January 2001.

Ten-Year Outlook

No further production expected.

* * *